

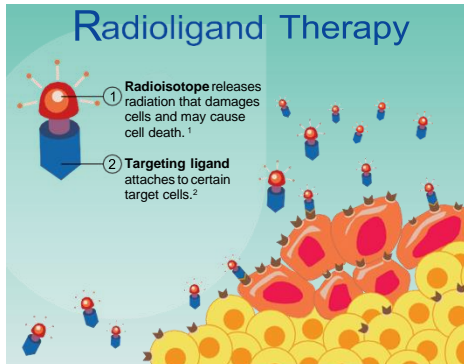
An Overview of Radioligand Therapies and How They Are Made

What are radioligand therapies (RLTs)?

Radioligand (ray-dee-o-lie-gand) therapies are a form of targeted nuclear medicine that doctors use to treat multiple types of cancer. RLTs deliver radiation to certain cancer cells that express specific targets.

Radioligand therapies have 2 key parts that are joined together by a chemical:

- A **radioisotope** (ray-dee-o-ice-o-tope)—a radioactive particle that releases radiation to target cells, destroying them
- A **targeting ligand** that attaches to cells that express specific targets, directing the radioisotope to cells with these targets



How do radioligand therapies work?

This innovative treatment approach is administered through an intravenous infusion and combines the power of radioisotopes with a target-seeking ligand to deliver radiation to cancer cells expressing a specific target, even when they have spread throughout the body. **With RLT, the goal is to deliver the treatment to the target cells to damage or destroy those cells while limiting impact to surrounding cells.**

How are radioligand therapies made?

Manufacturing new radioligand therapies requires a deep understanding of medicine, chemistry, physics, and biology. Special manufacturing and transportation are required to develop and ship this type of treatment. Because radioligand therapies lose their strength over time, the therapy has a limited timeframe of when it can be used, and each dose must get to the patient within a few days of being produced. This timing adds to the complexity. The whole process, shown below, takes about 14 days.

Novartis makes radioligand therapies at our facilities in Millburn, New Jersey (USA), Ivrea, Italy, and Zaragoza, Spain.



1. **Making the radioisotope:** Materials for radioligand therapies are made in specialized machines and then shipped to Novartis facilities.



2. **Joining the radioisotope and the ligand:** The next step is to attach the radioisotope to the ligand, or the cell-targeting component of RLT.



3. **Ensuring quality control:** The radioligand goes through quality control tests to ensure it is pure and potent (strong enough).



4. **Preparing doses:** The radioligand therapy is then prepared into treatment form, which is a liquid solution for infusion.



5. Packaging into lead containers: After another round of quality testing, the finished doses are packaged in special lead-shielded containers.



6. Shipping to treatment centers around the world: Once ready, finished doses in these special lead-shielded containers are carefully transported to the treatment centers.



7. Administering to patients within a few days: Each dose must get to the patient within a few days of being produced because radioligand therapies lose their strength over time.

At Novartis, we're working to bring the promising potential of radioligand therapies for patients with advanced cancers while keeping patient safety at the forefront of our manufacturing process.

References:

1. Jadvar H. Targeted radionuclide therapy: an evolution toward precision cancer treatment. *AJR Am J Roentgenol.* 2017;209(2):277-288.
2. Juric JG, Wong JYC, Knox SJ, et al. Targeted radionuclide therapy. In: Tepper JE, Foote RE, Michalski JM, eds. *Gunderson & Tepper's Clinical Radiation Oncology*, 5th ed. Elsevier, Inc; 2021.